



TECHNICAL DATA

Y654

PLANAR TRIODE HIGH MU

The Y654 is a miniature ceramic/metal rugged planar triode for advanced airborne, ground, and space applications up to 3.0 GHz.

The Y654 may be used as an amplifier, oscillator, or frequency multiplier in the C-W mode, grid- or plate-pulsed mode, as well as a modulator or regulator tube. In addition to the low interelectrode capacitance, high transconductance and amplification factor the Y654 has an arc-resistant cathode to assure stable, reliable, and long-life operation under adverse conditions, and a specially supported grid structure.

The Y654 is supplied without radiator and may be conduction, convection, heat sink, or liquid cooled. Radiators for forced air cooling, as well as heat sink adaptors, permitting an anode dissipation up to 300 watts, can be furnished on separate order.



GENERAL CHARACTERISTICS¹

ELECTRICAL

Cathode: Oxide Coated, Unipotential

Heater: Voltage	6.3 $\pm$ 0.3 V
Current, at 6.3 volts	1.30 A
Transconductance (Average):	
(200 mA/cm ²)	50
Amplification Factor (Average)	135
Direct Interelectrode Capacitance (grounded cathode) ²	
Cin	9.75 pF
Cout	0.065 pF max.
Cgp	1.05 pF
Cut-off Bias ³	-20 V
Frequency of Maximum Rating:	
CW	2500 MHz
Plate or Grid-Pulsed	3000 MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.
2. Capacitance values for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.
3. Measured with one milliamperes plate current and a plate voltage of 1 kVdc.

MECHANICAL

Maximum Overall Dimensions:

Length	1.370 in; 34.75 mm
Diameter	0.785 in; 19.94 mm

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Net Weight 0.56 oz; 16.0 gm
 Operating Position Any
 Maximum Operating Temperature:
 Ceramic/Metal Seals 250°C
 Anode Core 250°C
 Cooling Conduction, convection, forced air, or liquid
 Terminals Coaxial special

ENVIRONMENTAL

Shock, 11 ms, non-operating 60 G
 Vibration, operating, all axes 55 to 500 Hz 10 G
 Altitude, max (in a suitably designed circuit) 70,000 ft.

RANGE VALUES FOR EQUIPMENT DESIGN

	<u>Min.</u>	<u>Max.</u>
Heater Current at 6.3 volts	1.20	1.40 A
Cathode Warmup Time	60	--- sec.
Interelectrode Capacitance ¹ (grounded cathode connection)		
C _{in}	8.5	11.0 pF
C _{out}	---	0.065 pF
C _{gp}	0.90	1.20 pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pf due to the thermal expansion of the cathode.

**GRID PULSED OR PLATE PULSED AMPLIFIER
OR OSCILLATOR****ABSOLUTE MAXIMUM RATINGS:**

DC PLATE VOLTAGE (grid pulsed) . . . 8000 VOLTS
 PEAK PULSE PLATE VOLTAGE
 (plate pulsed) 10,000 VOLTS
 DC GRID VOLTAGE -200 VOLTS
 INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE
 Grid negative to cathode -750 VOLTS
 Grid positive to cathode 150 VOLTS
 PULSE PLATE CURRENT 6.0 AMPERES
 PULSE GRID CURRENT 2.5 AMPERES
 AVERAGE PLATE DISSIPATION
 Forced Air Cooling¹ 300 WATTS
 GRID DISSIPATION (Average) 1.5 WATTS
 FREQUENCY 3.0 GHz
 PULSE DURATION² 6.0 μ s
 DUTY FACTOR²0033

**OPERATING CONDITIONS IN REPRESENTATIVE
APPLICATION**GRID PULSED AMPLIFIER

Frequency	1.1 GHz
Heater Voltage	6.3 V
DC Plate Voltage	4000 Vdc
DC Grid Voltage	-80 Vdc
Peak Video Plate Current	1.8 a
Plate Efficiency	35 %
Pulse Drive Power (approx.)	200 w
Useful Power Output (approx.)	2500 w
Gain	11 db
Duty Factor	0.02

1. Using one of the EIMAC radiators shown on the cooling curves.
2. For applications using longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Devices Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.



PULSE MODULATOR AND PULSE AMPLIFIER SERVICE

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	10,000 VOLTS
PEAK PLATE VOLTAGE	12,000 VOLTS
DC GRID VOLTAGE	-150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE	
Grid negative to cathode . . .	-750 VOLTS
Grid positive to cathode . . .	100 VOLTS
PULSE CATHODE CURRENT . . .	9.0 AMPERES
DC PLATE CURRENT	190 MILLIAMPERES

CW RF POWER AMPLIFIER OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	7500 VOLTS
DC GRID VOLTAGE	-200 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE	
Grid negative to cathode . . .	-400 VOLTS
Grid positive to cathode . . .	30 VOLTS
DC PLATE CURRENT	300 MILLIAMPERES
DC GRID CURRENT	45 MILLIAMPERES

AVERAGE PLATE DISSIPATION

Forced Air Cooling ¹	300 WATTS
GRID DISSIPATION (Average)	1.5 WATTS
PULSE DURATION ²	6.0 μ s
CUT-OFF Mu	90

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2. For applications using longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Devices Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

AVERAGE PLATE DISSIPATION

Forced Air Cooling ¹	300 WATTS
GRID DISSIPATION (Average)	1.5 WATTS

1. Using one of the EIMAC radiators shown on the cooling curves.

APPLICATION

COOLING - The Y654 can be cooled by conduction, convection, forced air, or liquid cooling. The tube is designed to permit high-temperature operation up to the limit indicated. However, if long life is the prime objective, tube terminal and seal temperatures should be kept well below 250°C. If forced air cooling is provided, auxiliary air flow, apart from the air flowing thru the radiator, should be provided to cool the tube envelope and other tube terminals. Some conduction cooling is always provided thru the contact terminals. However, these terminals usually exhibit poor heat transfer, often having a temperature gradient

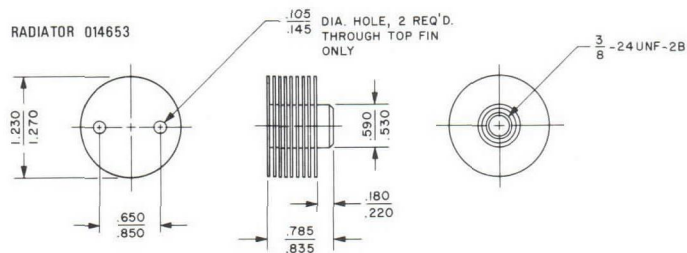
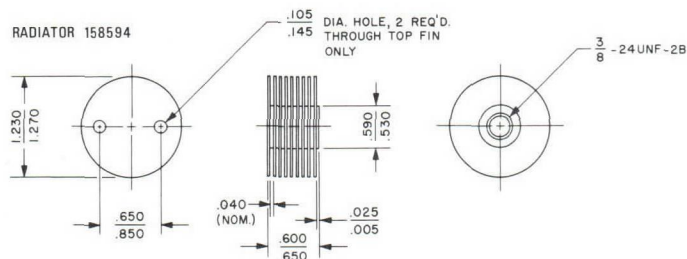
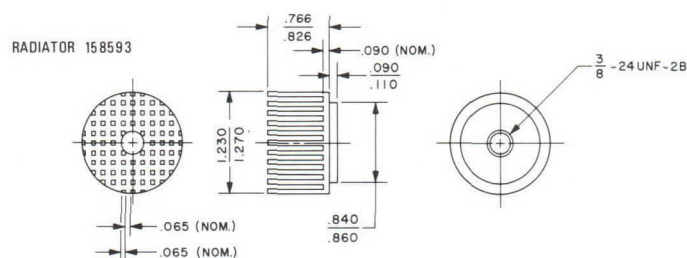
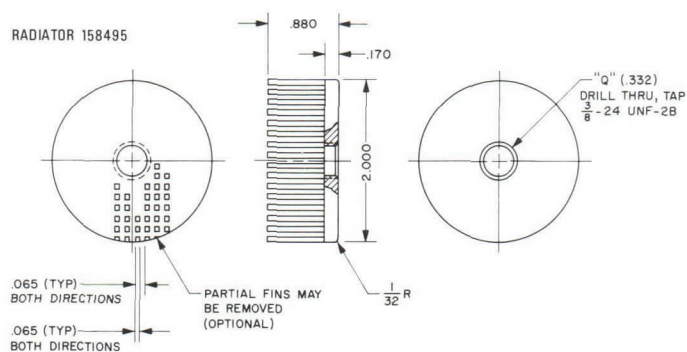
across them as high as 50°C. Cooling curves are given for four standard radiators which are suitable for use with the Y654. Special cooling designs are available upon request.

For unusual operating conditions contact the nearest Varian Electron Tube and Devices Field Office or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

For general operating information refer to EIMAC bulletin #15, "Operating Data for Planar Triodes."



Y654



COMBINED CORRECTION FACTORS FOR INLET AIR TEMPERATURE AND ALTITUDE
(RELATIVE TO 25°C AND SEA LEVEL)

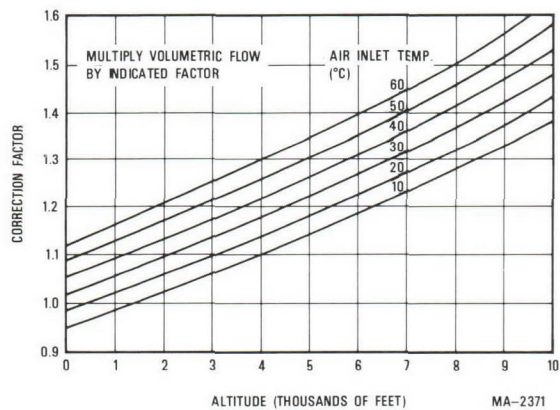
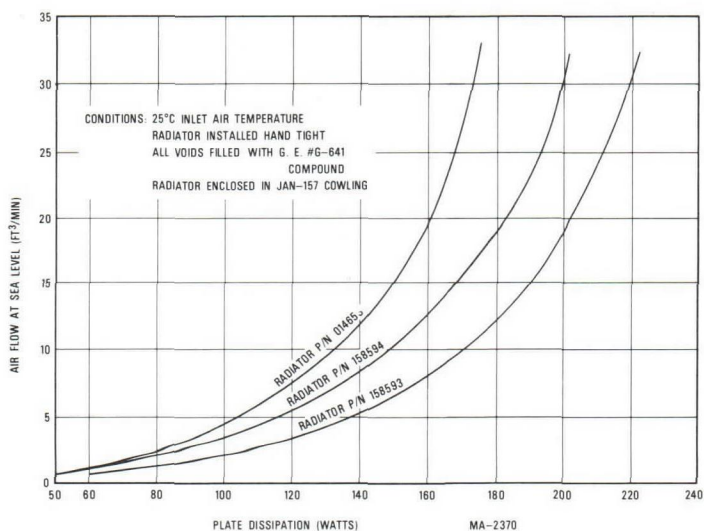
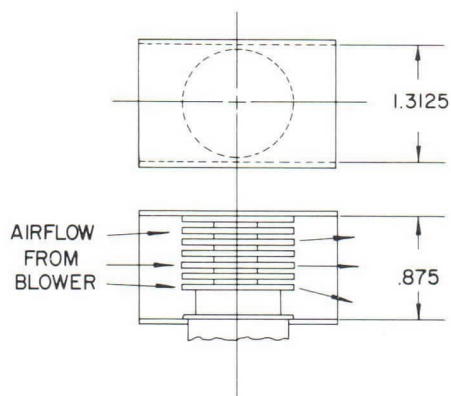


PLATE DISSIPATION VARIATION WITH COOLING AIR FLOW

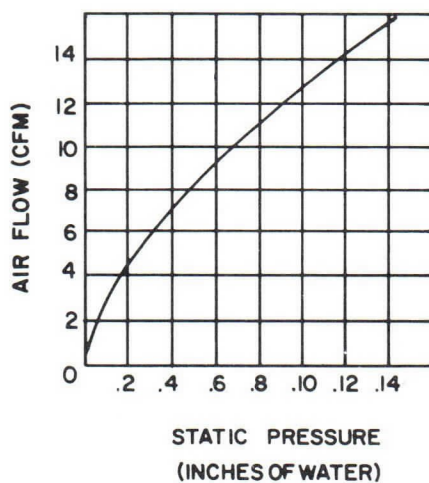


AIRFLOW COWLING FOR EIMAC "PIN" RADIATOR PART #158495

AIRFLOW vs STATIC PRESSURE WITH
STANDARD COWLING JAN-157



- STANDARD COWLING -
FOR 014653, 158594, 158593
RADIATORS



NOTE ORIENTATION OF
PINS WITH RESPECT
TO AIR FLOW FOR
MAXIMUM COOLING

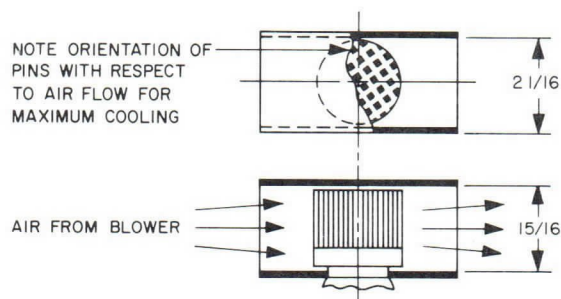
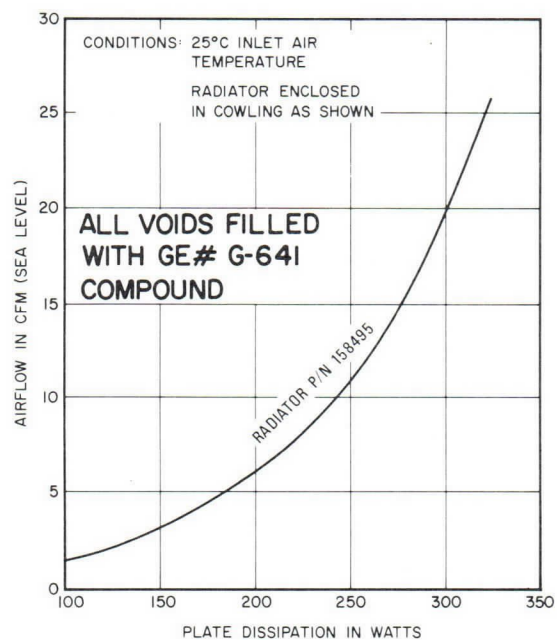
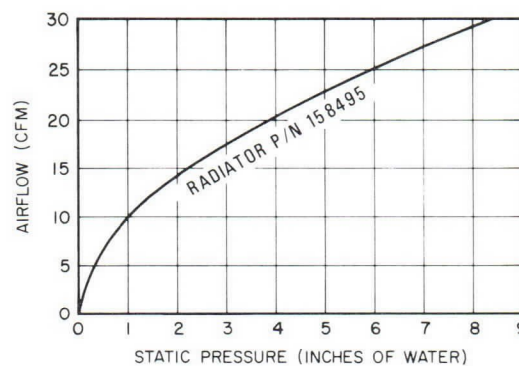


PLATE DISSIPATION VARIATION WITH COOLING AIRFLOW





Y654

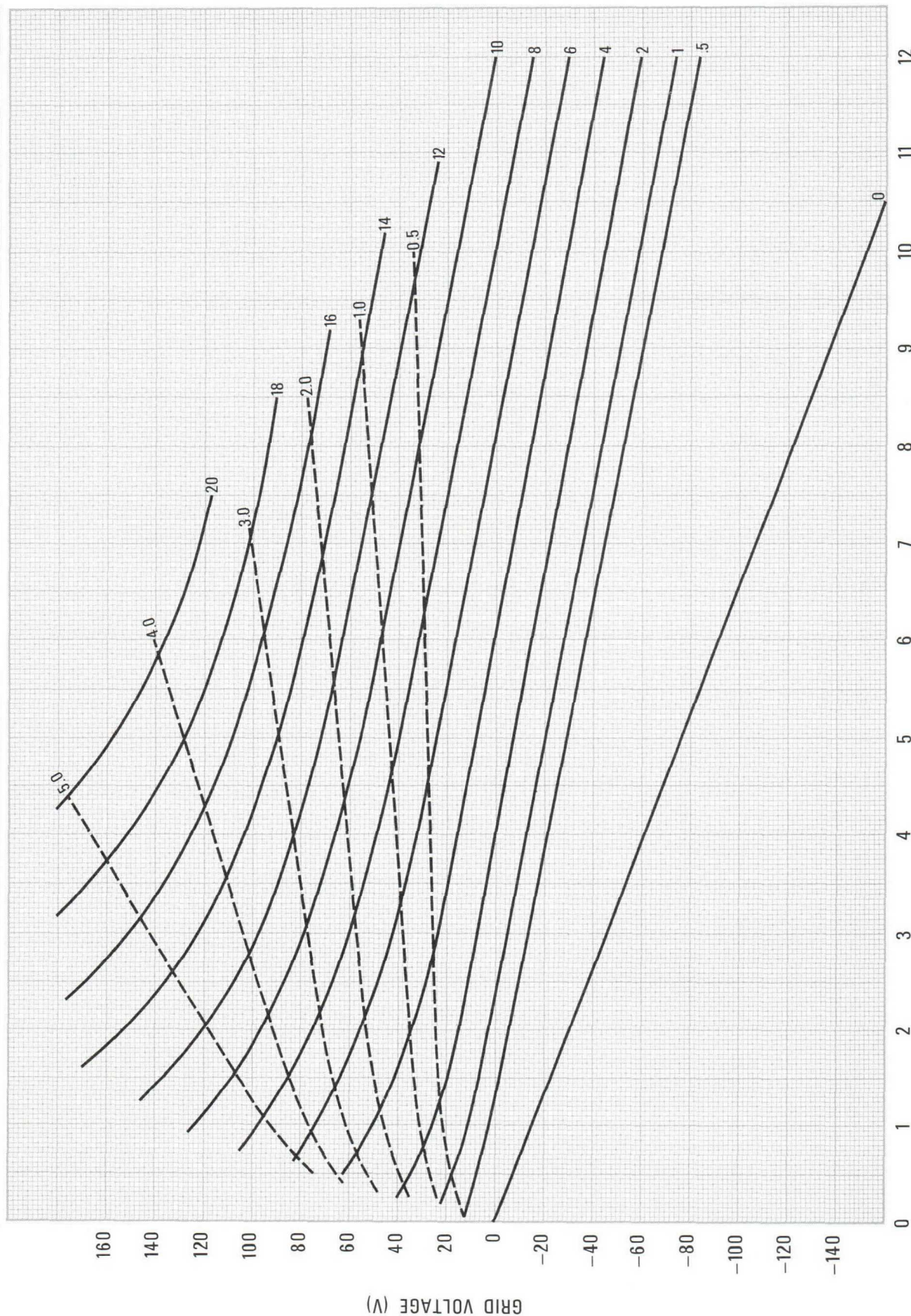
TYPICAL CONSTANT CURRENT CHARACTERISTICS

FOR PULSE OPERATION

$E_f = 6.3V$

— PLATE CURRENT — AMPERES

--- GRID CURRENT — AMPERES



CURVE #MA-2467

PLATE VOLTAGE (kV)

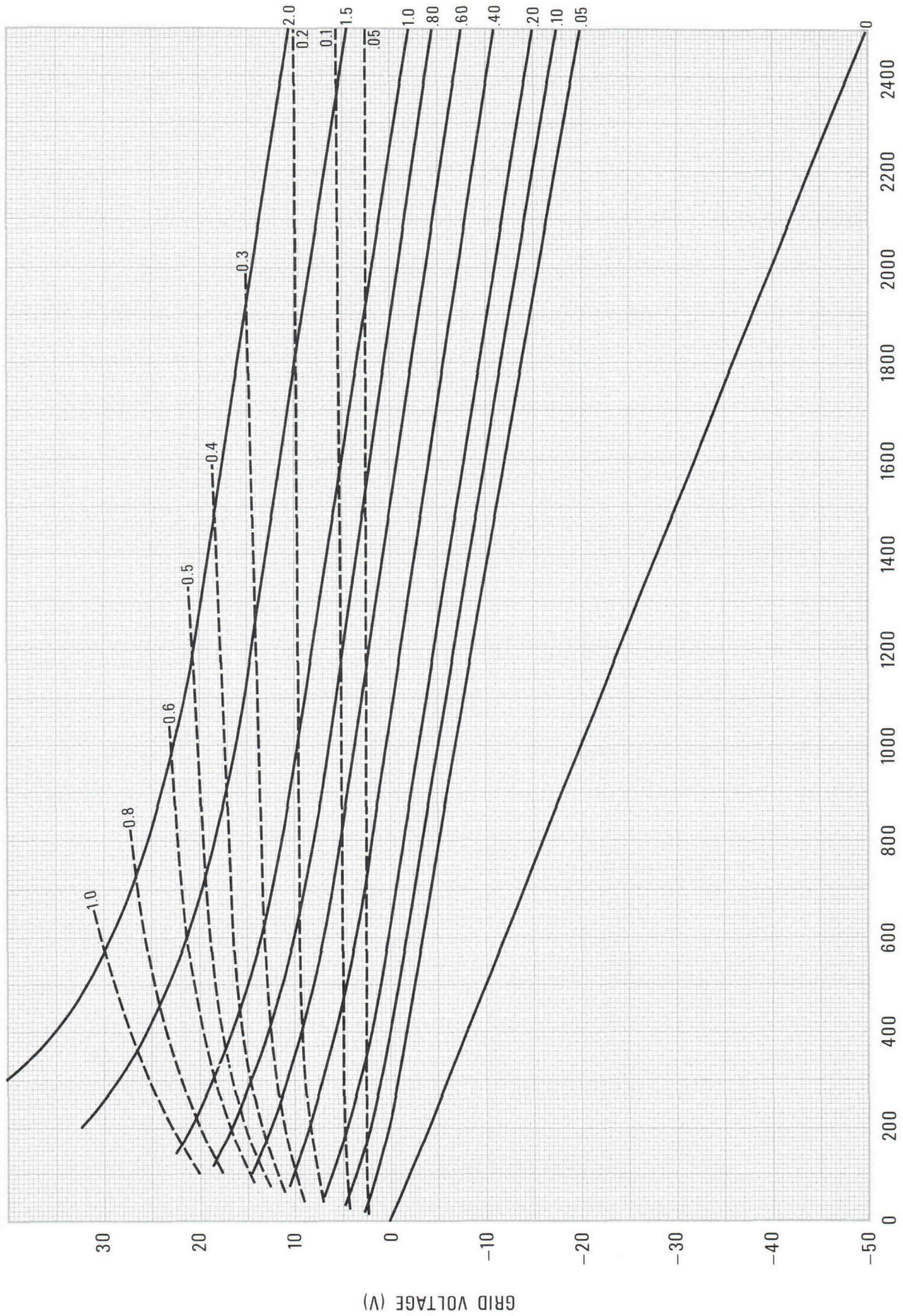
GRID VOLTAGE (V)



TYPICAL CONSTANT CURRENT CHARACTERISTICS

$E_f = 6.3V$

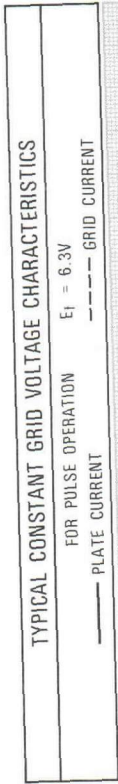
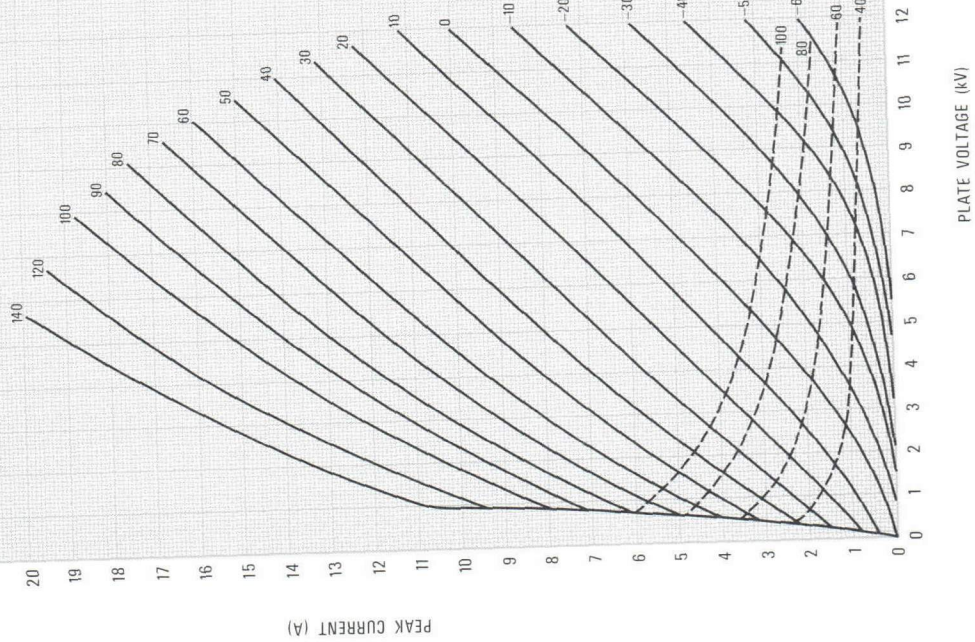
— PLATE CURRENT — AMPERES - - - - - GRID CURRENT — AMPERES



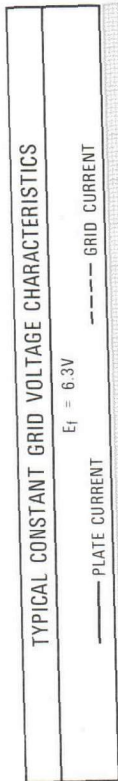
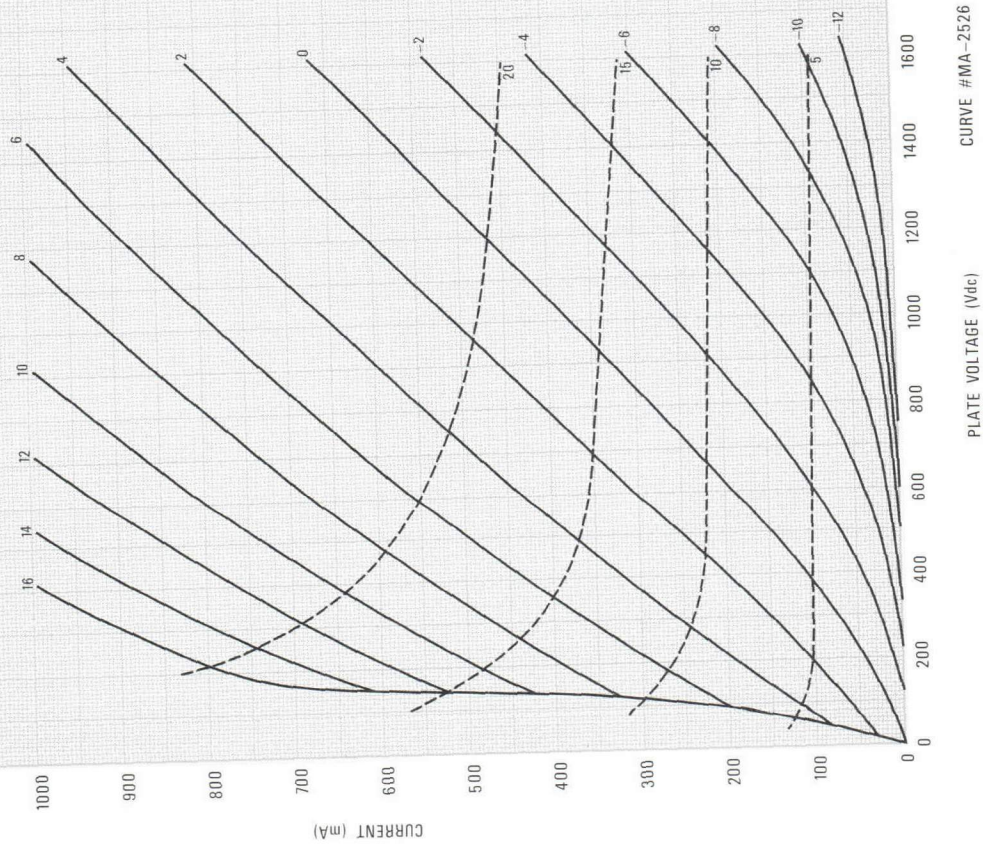
CURVE #MA-2527



Y654



CURVE #MA-2547



CURVE #MA-2526